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FOLIAR DISCOLORATION OF WESTERN LARCH ON THE BOISE AND PAYETTE NATIONAL FORESTS

by
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ABSTRACT

Widespread, intense, discoloration of western larch, Larix occidentalis Nutt, foliage was observed throughout western larch stands within and adjacent to the Boise and Payette National Forests in 1981 while discoloration observed in 1982 was very limited both in distribution and severity. Two pests were responsible for much of the discoloration: larch casebearer, Coleophora laricella (Hbn.), which was active early in the year, and a needle pathogen, Meria laricis Vuill., which persisted throughout the summer months.

INTRODUCTION

Infrequent, widely dispersed discoloration of western larch foliage has been reported in the Intermountain Region since 1977 (Valcarce 1977). Initially, foliage discoloration was noted early in the year but was barely noticeable after mid-summer following emergence of a second crop of needles. Discoloration has become increasingly widespread and intense until 1980 when western larch generally throughout its type was severely discolored during the entire growing season.

An evaluation of western larch discoloration was initiated in 1981 to:

1. determine location and extent of discolored western larch in the Intermountain Region,

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2. determine agent(s) responsible for western larch needle discoloration, and

3. identify needed monitoring and/or management alternatives.

METHODS

In late May 1981, a fixed-wing aircraft was used to survey the entire range of western larch in the Intermountain Region. Areas of affected trees were mapped to aid in selecting stands for later field sampling.

Fourteen areas were selected for field sampling with selection being based on presence of discolored foliage, overall acreage of contiguous western larch type, size of potential sample trees, and accessibility to survey crews. Characteristically, selected sample stands occupied northern exposures or valley bottoms with elevations ranging from 4,500 feet to 6,500 feet. Large homogeneous stands were rare; most contiguous stands were under 400 acres in size. Both pure and mixed stands were sampled.

Selected stands were accessed by road or by rotor-wing aircraft. In each stand, branch samples were collected from representative western larch trees 10 to 30 feet tall. Samples from each tree were bagged separately and taken to the laboratory for examination. Sample stands were observed again during routine aerial detection surveys later in 1981, and sites accessible by ground travel were revisited throughout the year.

In May 1982, the western larch type was again aerially surveyed to monitor discoloration. Ground evaluations were made in conjunction with other activities. Samples for laboratory examination were not collected.

RESULTS

In 1981, aerial surveys revealed that most western larch on the Boise and Payette National Forests displayed varying degrees of foliar discoloration (fig. 1). Severe discoloration on the Boise National Forest was noted on the west side of Cascade Reservoir and near Smith's Ferry. On the Payette National Forest severe discoloration was observed along the Elkhorn and French Creek drainages and in the area surrounding McCall. Light to moderate discoloration was observed in the remaining areas of western larch on both Forests. Discoloration was not restricted by elevation or aspect, nor were damage symptoms confined to large, contiguous western larch stands. Small groups of trees and single trees were discolored with the same frequency and intensity as were trees in large, homogeneous stands. Occasionally single trees, as well as entire stands located adjacent to affected stands, displayed no visible damage symptoms.

Evaluation of foliage samples collected during the 1981 ground surveys revealed that larch casebearer was responsible for the light-yellowish to red needle appearance occurring immediately after emergence of new foliage in the spring. Damage appeared to be most severe on branch tips and on unshaded branches. Close examination revealed dry yellow to red, hook-

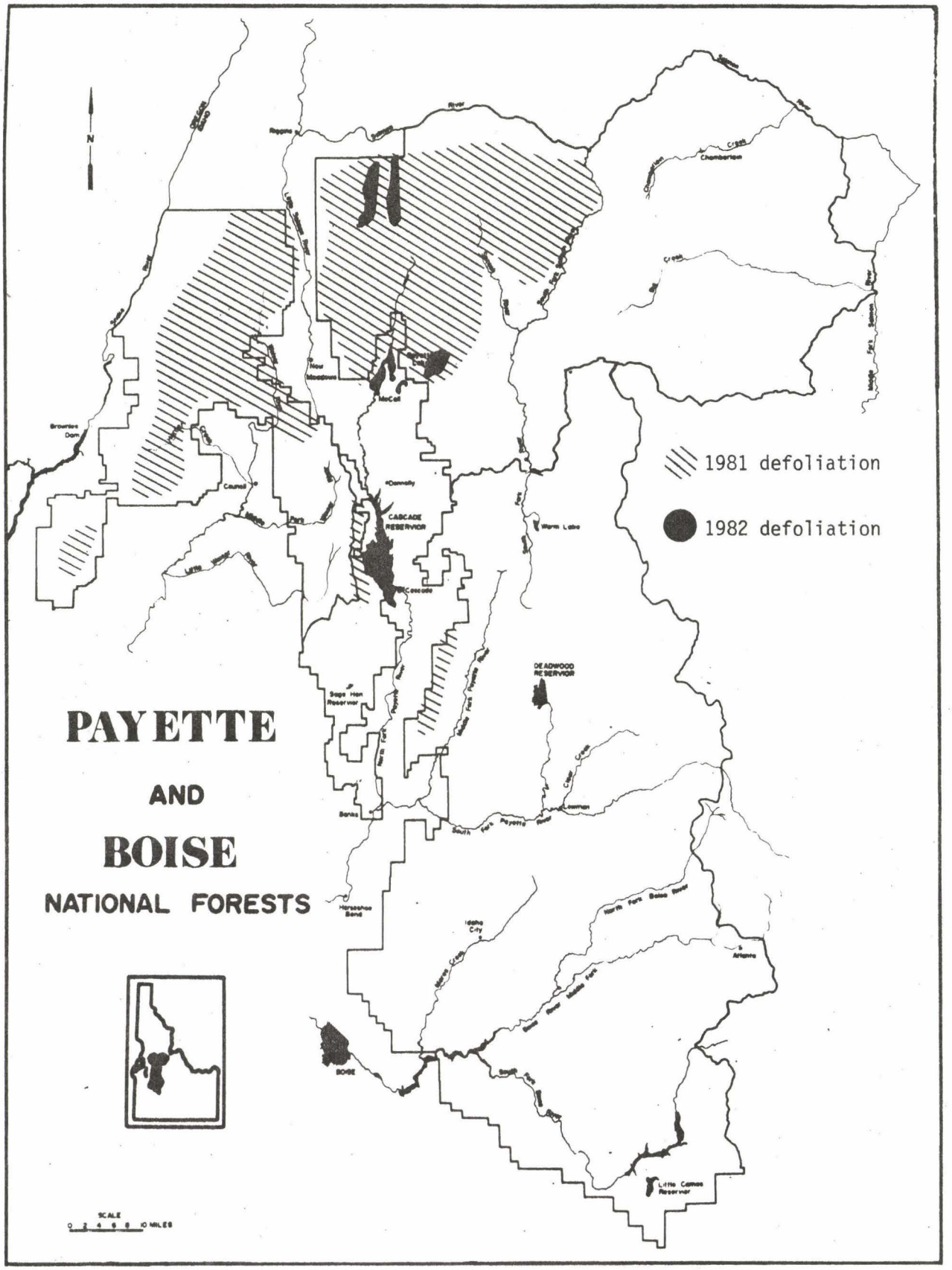

Figure 1. Extent of foliar discoloration of western larch during 1981 and 1982 as determined by aerial and ground surveys.

shaped needles indicative of larch casebearer feeding. Small larvae with black heads and red-brown bodies encapsulated in grey, cigar-shaped overwintering cases were apparent on affected branches and foliage. Continued sampling revealed increased amounts of foliage discoloration; however, a decline in larch casebearer activity was noted. Discoloration of needles slightly affected or unaffected by larch casebearer appeared to be initiated from randomly located "red" spots that gradually enlarged until entire needles were redish brown. In some cases, newly emerged shoots were killed. A needle pathogen, Meria laricis, was determined by cultural and microscopic examination to be responsible for the mid- to late-summer discoloration. Damage was more intense in the lower and mid-crowns of affected trees and, unlike larch casebearer damage, was more severe in shaded areas. Needles were cast continuously, and fructifications on the needle surface were visible under magnification as rows of white spots. Another needle pathogen, Hypodermella laricis Tub., was found infrequently. It was distinguished from M. laricis by the small, elongated, black spore-producing structures produced on upper needle surfaces and the decurved positioning of dead needles.

In 1982, minor amounts of discoloration were aerially observed in the French Creek, Lake Fork Creek, and Elkhorn Creek drainages on the Payette National Forest (fig. 1). No substantial discoloration was observed on the Boise National Forest.

Widely scattered, very light discoloration of foliage on lower crowns of western larch was observed during field evaluations in many areas of the Forests throughout spring and summer. In all areas, the most frequently occurring pest was M. laricis. Larch casebearer damage was seldom observed.

DISCUSSION

Western larch trees, being deciduous, are more tolerant of defoliation than are other conifers (Denton 1965). Though accurate growth reduction data remain unavailable, it seems likely that the continuous damage to larch foliage, first by larch casebearer, then by M. Laricis, significantly impacts tree growth. Growth loss, likely, is not additive since the same needles may be affected by both organisms. However, tree mortality may increase due to the continuous reduction of the photosynthetic surface during the growing season. Growth loss resulting from repeated defoliation also puts western larch, a shade-intolerant species, at a competitive disadvantage, thus reducing its potential for recovery after foliage discoloration has abated (Denton 1979).

Larch casebearer produces one generation per year. It overwinters as third-instar larvae within needle "cases." In the spring, larval emergence and feeding coincides with needle growth. Larvae pupate, and the small, tan-colored, adult moths emerge in early July. Eggs are laid on the needles, and newly hatched larvae mine green needles. Feeding continues until the first frost when they form the "cases" in which to overwinter. Should the supply of needles on which to feed, lay eggs, and overwinter be limited due to infection by M. laricis, it seems likely that populations of the insect would be seriously affected. This may partially explain the

significant reduction of larch casebearer activity in 1982. Because insect populations often require several years to expand to outbreak proportions, severe, widespread defoliation by the insect is not anticipated in 1983.

Two chemicals, Malathion and Methoxychlor, are currently registered for use in controlling larch casebearer. Although effective on a small scale basis, chemical control on a forest-wide basis is economically not feasible because of the scattered occurrence of western larch. Treatment of esthetically high value western larch over small areas can be undertaken in the spring after the insect emerges from hibernation and begins feeding on new foliage or in the fall prior to third instar larval encasement (Denton 1979).

The use of biological agents to control larch casebearer is being evaluated in northern Idaho and western Montana (Niwa and Hard 1981). In 1978, a project to establish these agents in southern Idaho larch stands was initiated. The parasitic wasp, Agathis pumila Ratz., was released in nine locations on the Boise and Payette National Forests. Release of a second parasite, Chrysocharis laricellae Ratz., was accomplished during 1980 (Valcarce and Lowe 1980). Efficacy of these agents is being monitored (Thier 1982).

Meria laricis overwinters on needles remaining attached to the tree or lying on the ground. Infection occurs by airborne spores and can be initiated on any part of the needle. Infected needles rapidly turn a reddish-brown color and are frequently confused with larch casebearer-damaged needles. Above-average temperatures and precipitation during spring months create ideal conditions for the spread of and infection by this fungus (Peace and Holmes 1933). Given proper environmental conditions in 1983, discoloration and defoliation caused by this agent could again be heavy. Direct control measures for forest-wide application have not been developed but likely would not be practical.

RECOMMENDED MANAGEMENT

As indicated earlier, direct control of either pest is impractical on a forest basis. Although management of these pests through silvicultural means is untested, several measures may be implemented to reduce their impacts. Initially, affected stands should be rated as to severity of defoliation. Additional in-depth aerial survey information could be used for this purpose, supplemented with ground-survey data. Where possible, stand management activities in severely affected stands with high growth potential should be accelerated. Development of stands of mixed-species composition should be an objective of stand treatments.

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